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10/026,395	12/21/2001	David V. Tsu	2072	1025
24963	7590	10/06/2004	EXAMINER	
ENERGY CONVERSION DEVICES, INC. 2956 WATERVIEW DRIVE ROCHESTER HILLS, MI 48309			AGUSTIN, PETER VINCENT	
			ART UNIT	PAPER NUMBER
			2652	

DATE MAILED: 10/06/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

### Application No.

10/026,395

### Applicant(s)

TSU, DAVID V.

### Examiner

Peter Vincent Agustin

### Art Unit

2652

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-42 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-42 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 December 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_.

## **DETAILED ACTION**

### ***Drawings***

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the plurality of energy pulses of claims 1 & 13 and the method steps of claim 26 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

2. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors, e.g.,

Page 5, line 10: "at least" should be deleted.

Page 14, lines 11 & 15: "tract" should be --track--.

Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

#### *Claim Objections*

4. Claims 13-20 are objected to because of the following informalities:

Claim 13, line 1: "recording an" should be --recording information to an--.

Claims 14-20 are dependent upon claim 13.

Appropriate correction is required.

#### *Claim Rejections - 35 USC § 102*

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(c) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1-3, 6, 12, 13, 18 & 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Imaino et al. (hereafter Imaino) (US 5,555,537).

In regard to claim 1, Imaino discloses a method of recording information to an optical memory device (figure 1, element 12), the device having a state-changeable active material

Art Unit: 2652

(column 3, line 55), the method comprising the step of: forming a mark by applying a plurality of energy pulses to said active material (column 8, line 11-16), said pulses effective to provide at least 50% capacitive cooling (inherent). As disclosed by the applicant in the instant specification, capacitive cooling is the result of the media characteristic and pulse width characteristic (see page 9, second paragraph). Specifically, the applicant states that the appropriate cooling behavior, i.e., increased relative proportion of capacitive cooling (for example, the claimed at least 50% capacitive cooling), may be achieved by applying energy pulses with relatively short pulse widths to an optical memory device (page 12, lines 10-12). In one embodiment (see lines 14-19 of the same paragraph), the applicant recites that this cooling behavior is achieved by forming marks using a plurality of energy pulses having a pulse width less than 14 nanoseconds (a limitation in claim 13), less than 10 nanoseconds, less than 7 nanoseconds, etc. Therefore, in view of the rejection to claim 13 (see rejection below), the claimed at least 50% capacitive cooling would be the inherent result of the plurality of energy pulses having a pulse width less than 14 nanoseconds, as taught by Imaino. Likewise, in regard to claims 2 & 3 and using the same rationale applied against claim 1, Imaino inherently discloses that said pulses are effective to provide at least 55% or at least 60% capacitive cooling.

In regard to claim 6, Imaino discloses that said mark comprises an amorphous material (column 4, line 21).

In regard to claim 12, Imaino discloses applying a plurality of energy pulses to said active material, each of said pulses having a pulse width less than 14 nanoseconds (column 8, line 11-16).

In regard to claim 13, Imaino discloses a method of recording to an optical memory device (figure 1, element 12), the device having a state-changeable active material (column 3, line 55), the method comprising the step of: forming a mark by applying a plurality of energy pulses to said active material, each of said pulses having a pulse width less than 14 nanoseconds (column 8, lines 11-16).

In regard to claim 18, Imaino discloses that said mark comprises an amorphous material (column 4, line 21).

In regard to claim 19, Imaino discloses that the optical memory device is an optical disk (column 3, line 31).

7. Claims 13 & 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Udagawa et al. (hereafter Udagawa) (US 5,513,167).

In regard to claim 13, Udagawa discloses a method of recording to an optical memory device (figure 4, element 1), the device having a state-changeable active material (column 6, lines 61-65), the method comprising the step of: forming a mark by applying a plurality of energy pulses to said active material (column 4, lines 47-57), each of said pulses having a pulse width less than 14 nanoseconds (column 6, lines 12-20).

In regard to claim 20, Udagawa discloses that the active material comprises a chalcogenide (column 6, line 64).

8. Claims 26, 27, 31-34 & 38-42 are rejected under 35 U.S.C. 102(e) as being anticipated by O'Neill et al. (hereafter O'Neill) (US 6,775,218).

In regard to claim 26, O'Neill discloses a method of recording information to an optical recording medium comprising a phase change material (abstract, lines 1-2), said method

Art Unit: 2652

comprising the steps of: applying energy having a spatial profile to said phase change material (column 6, lines 31-33), said spatial profile defining a region of spatial overlap (figure 3A, element 301) of said energy with said phase change material (column 7, lines 16-20), said energy providing a temperature profile (figure 2) within said region of spatial overlap (column 6, lines 15-17), said temperature profile defining a spatial distribution of temperatures (temperatures above and below  $T_m$  or  $T_g$ ), said spatial distribution including temperatures (temperatures above  $T_m$ ) sufficient to permit formation of an amorphous phase in said region of spatial overlap; forming a mark (figure 3A, element 301) coinciding with the portions of said spatial distribution having a temperature sufficient to form an amorphous phase, said mark comprising an amorphous phase, said amorphous phase forming upon cooling of said region of spatial overlap (column 7, lines 3-7), said cooling releasing energy in excess of the energy required to form said amorphous phase (note that during forming of an amorphous state (temperatures above  $T_m$ ), energy is absorbed, on the other hand, during cooling, energy is released); dissipating said excess energy to portions of said phase change material outside (figure 3A, element 302) of the spatial region coinciding with said mark (301), said dissipating occurring at a rate sufficient to prevent formation of an amorphous phase in said portions outside of said mark (see column 7, lines 3-14: note that “forming crystalline material in the annular region” corresponds to the claimed “prevent formation of an amorphous phase in said portions outside of said mark”).

In regard to claim 27, O'Neill discloses that said energy is applied in the form of an energy pulse (column 6, line 67; see also column 17, line 39).

In regard to claim 31, O'Neill discloses that said energy is applied in the form of a plurality of energy pulses (column 17, lines 39 & 46).

Art Unit: 2652

In regard to claim 32, O'Neill discloses that said energy is applied with a laser (abstract line 4).

In regard to claim 33, O'Neill discloses that said spatial profile is uniform (column 6, lines 52-54: "circular symmetry").

In regard to claim 34, O'Neill discloses that said spatial profile is a Gaussian profile (column 6, lines 50-52).

In regard to claim 38, O'Neill inherently discloses that said temperature profile is uniform. Column 6, lines 33 suggest that temperature is a function of laser energy. Since the laser energy is uniform (column 6, lines 52-54: "circular symmetry"), then it follows that the temperature profile is also uniform.

In regard to claim 39, O'Neill discloses that said mark coincides with said region of spatial overlap (as shown in figure 3A, element 301).

In regard to claim 40, O'Neill discloses that said mark provides for more than two recording levels (column 4, lines 3-4).

In regard to claims 41 & 42, O'Neill discloses that said cooling/dissipating step comprises capacitive cooling (column 5, line 19: "cools rapidly").

### ***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.



Art Unit: 2652

10. Claims 4 & 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Imaino in view of Toda et al. (hereafter Toda) (US 5,642,343).

For a description of Imaino, see the rejection above. However, in regard to claim 4, Imaino does not explicitly disclose that said forming step is effective to control the shape of said mark. Furthermore, in regard to claim 17, Imaino does not explicitly disclose that said mark has a constant width or a tapering width.

Toda discloses controlling the shape of a mark (abstract, line 9; column 41, lines 3-13). It would have been obvious to one of ordinary skill in the art at the time of invention by the applicant to have configured the forming step of Imaino to control the shape of said mark, as suggested by Toda, the motivation being to realize a high density optical recording (last three lines of abstract).

Toda discloses a mark having a constant width (see figure 3c) (see also figure 38: "tear-shaped magnetic domain", i.e., claimed tapering width). It would have been obvious to one of ordinary skill in the art at the time of invention by the applicant to have provided the mark of Imaino with a constant width, as suggested by Toda, the motivation being to maintain a constant reproduction signal amplitude (column 15, lines 19-25), thereby preventing reproduction error.

11. Claims 7, 8, 11, 21, 22 & 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Imaino in view of Kudo et al. (hereafter Kudo) (US 5,148,335).

For a description of Imaino, see the rejection above. However, in regard to claims 7 & 21, Imaino does not explicitly state that said mark provides for more than two recording levels. Furthermore, in regard to claims 8 & 22, Imaino does not explicitly state that a plurality of said marks are formed and the active material has a plurality of data cells of uniform dimension, each

Art Unit: 2652

mark being formed entirely within a data cell. Furthermore, in regard to claims 11 & 25, Imaino does not explicitly state that each mark is constant in length.

In regard to claims 7 & 21, Kudo discloses recording marks (see figure 9) that provide for more than two recording levels (A thru E). It would have been obvious to one of ordinary skill in the art at the time of invention by the applicant to have provided the more than two recording levels of Kudo to the mark of Imaino, the motivation being to provide an optical recording medium having high density (column 2, lines 34-37).

In regard to claims 8 & 22, Kudo discloses that a plurality of said marks are formed (as shown in figure 9) and the active material has a plurality of data cells of uniform dimension, each mark being formed entirely within a data cell (inherently suggested by the uniform sizes/spacing of marks). It should also be noted that the unique feature of the more than two recording levels of Kudo is that the recording marks have exactly the same dimensions, and the levels are differentiated using the amount of reflected light. The claimed data cells correspond to the uniformly-distanced areas that separate the multilevel recording marks. It would have been obvious to one of ordinary skill in the art at the time of invention by the applicant to have formed a plurality of said marks of Imaino within data cells of uniform dimension as suggested by Kudo, the motivation being to provide an optical recording medium having high density (column 2, lines 34-37).

In regard to claim 11 & 25, Kudo discloses that each mark is constant in length (as shown in figure 9). It would have been obvious to one of ordinary skill in the art at the time of invention by the applicant to have provided each mark of Imaino with constant length as suggested by Kudo, the motivation being to provide an optical recording medium having high density (column

Art Unit: 2652

2, lines 34-37). It should be noted that in order to provide a high density optical recording medium, the lengths of the recording marks are kept constant (as opposed to varying lengths which would consume more disc space but less information, see figure 3 (prior art)) while the intensity of the marks are varied into five levels.

12. Claims 9 & 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Imaino & Kudo as applied to claims 8 & 22 above, and further in view of Ishibashi et al. (hereafter Ishibashi) (US 5,295,131).

For a description of Imaino & Kudo, see the rejection above. However, in regard to claims 9 & 23, Imaino & Kudo do not explicitly disclose that the mark is provided without significantly altering marks of other data cells.

Ishibashi discloses providing a mark without significantly altering marks of other data cells (column 6, lines 44-58). It would have been obvious to one of ordinary skill in the art at the time of invention by the applicant to have provided the mark of Imaino & Kudo without significantly altering marks of other data cells as suggested by Ishibashi, the motivation being to prevent accidental erasure of neighboring marks, thereby ensuring error-free recording.

13. Claims 10 & 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Imaino & Kudo as applied to claims 8 & 22 above, and further in view of Wong et al. (hereafter Wong) (US 5,818,806).

For a description of Imaino & Kudo, see the rejection above. However, in regard to claims 10 & 24, Imaino & Kudo do not disclose that marks of different recording levels are differentiated by mark width.

Art Unit: 2652

Wong discloses marks of different recording levels that are differentiated by mark width (column 4, lines 63-67). It would have been obvious to one of ordinary skill in the art at the time of invention by the applicant to have differentiated the marks of Imaino & Kudo by mark width as suggested by Wong, the motivation being to provide a recording medium having increased data storage capacity (a purpose of multilevel recording which is well-known in the art).

14. Claims 14 & 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Udagawa.

For a description of Udagawa, see the rejection above. However, in regard to claims 14 & 15, Udagawa does not disclose that each pulse width is less than 10 nanoseconds or 7 nanoseconds.

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have used a pulse width less than 10 or 7 nanoseconds because applicant has not disclosed that a pulse width less than 10 or 7 nanoseconds provides an advantage, is used for a particular purpose, or solves a stated problem, and one of ordinary skill in the art would have expected the applicant's invention to perform equally well with either the pulse width less than 14 nanoseconds taught by Udagawa or the claimed pulse width less than 10 or 7 nanoseconds because all these ranges perform the same function of decreasing the pulse width in order to prevent a heat of a preceding signal from interfering with a succeeding signal (column 6, lines 12-20). Furthermore, choosing pulse width values less than 10 or 7 nanoseconds would have been an obvious matter of design choice.

15. Claims 16 & 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Udagawa in view of Toda et al. (hereafter Toda) (US 5,642,343).

Art Unit: 2652

For a description of Udagawa, see the rejection above. However, in regard to claim 16, Udagawa does not explicitly disclose that said forming step is effective to control the shape of said mark. Furthermore, in regard to claim 17, Udagawa does not explicitly disclose that said mark has a constant width or a tapering width.

Toda discloses controlling the shape of a mark (abstract, line 9; column 41, lines 3-13). It would have been obvious to one of ordinary skill in the art at the time of invention by the applicant to have configured the forming step of Udagawa to control the shape of said mark, as suggested by Toda, the motivation being to realize a high density optical recording (last three lines of abstract).

Toda discloses a mark having a constant width (see figure 3c) (see also figure 38: "tear-shaped magnetic domain", i.e., claimed tapering width). It would have been obvious to one of ordinary skill in the art at the time of invention by the applicant to have provided the mark of Udagawa with a constant width, as suggested by Toda, the motivation being to maintain a constant reproduction signal amplitude (column 15, lines 19-25), thereby preventing reproduction error.

16. Claims 28-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Neill in view of Udagawa.

For a description of O'Neill, see the rejection above. However, in regard to claim 28, O'Neill is silent to whether said energy pulse has a pulse duration of less than 14 nanoseconds. Furthermore, in regard to claims 29 & 30, O'Neill is silent to whether said energy pulse has a pulse duration of less than 10 nanoseconds or 7 nanoseconds.

Udagawa discloses energy pulses having a pulse durations less than 14 nanoseconds (column 6, lines 12-20). It would have been obvious to one of ordinary skill in the art at the time of invention by the applicant to have provided a pulse duration of less than 14 nanoseconds to the energy pulse of O'Neill as suggested by Udagawa, the motivation being to decrease the pulse width in order to prevent a heat of a preceding signal from interfering with a succeeding signal (column 6, lines 12-20), thereby preventing recording error.

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have used a pulse width less than 10 or 7 nanoseconds because applicant has not disclosed that a pulse width less than 10 or 7 nanoseconds provides an advantage, is used for a particular purpose, or solves a stated problem, and one of ordinary skill in the art would have expected the applicant's invention to perform equally well with either the pulse width less than 14 nanoseconds taught by Udagawa or the claimed pulse width less than 10 or 7 nanoseconds because all these ranges perform the same function of decreasing the pulse width in order to prevent a heat of a preceding signal from interfering with a succeeding signal (column 6, lines 12-20). Furthermore, choosing pulse width values less than 10 or 7 nanoseconds would have been an obvious matter of design choice.

17. Claims 35 & 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Neill in view of Ovshinsky (US 3,530,441).

For a description of O'Neill see the rejection above. However, in regard to claim 35, O'Neill does not explicitly disclose that said phase change material comprises a chalcogenide. Furthermore, in regard to claim 36, O'Neill does not explicitly disclose that said phase change material comprises an element selected from the group consisting of Ge, Sb, Se, In, Ag and Te.

Art Unit: 2652

Ovshinsky discloses a phase change material comprising a chalcogenide (column 10, line 22) or Ge, Sb, Se or Te (column 10, lines 20-28). It would have been obvious to one of ordinary skill in the art at the time of invention by the applicant to have used chalcogenide or Ge, Sb, Se or Te for the phase change material of O'Neill as suggested by Ovshinsky, the motivation being to improve cyclability of data recording and erasing operations (see also Nonoyama et al. (US 5,646,924): column 1, lines 35-53).

18. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over O'Neill in view of McDonald et al. (hereafter McDonald) (US 6,563,779).

For a description of O'Neill, see the rejection above. However, O'Neill does not explicitly disclose that said region of spatial overlap is substantially cylindrical.

McDonald discloses an optical disc having a cylindrical region where a laser beam is reflected (column 3, lines 50-65). It would have been obvious to one of ordinary skill in the art at the time of invention by the applicant to have provided a cylindrical shape to the region of spatial overlap of O'Neill as suggested by McDonald, the motivation being to obtain a recording medium having a higher storage density.

### *Conclusion*

19. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kikukawa et al. (US 6,169,722) discloses a phase change type optical recording medium having minute length recorded marks. The recording mark of figure 3 is produced by rapid cooling and the crystallized region is formed by slow cooling.

Art Unit: 2652

Nagashima et al. (US 4,403,318) discloses a recording/reproducing/erasing apparatus wherein a surface is changed from crystalline to amorphous by heating followed by quick cooling, and restored back to crystalline by heating followed by slow cooling.

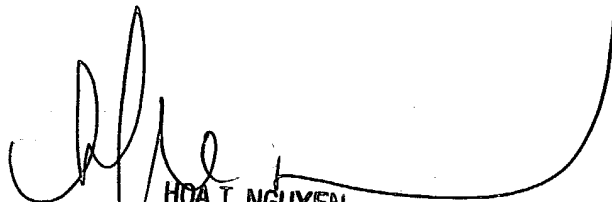
20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter Vincent Agustin whose telephone number is 703-305-8980.

The examiner can normally be reached on Monday-Friday 9:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa Thi Nguyen can be reached on 703-305-9687. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Peter Vincent Agustin  
Art Unit 2652  
September 9, 2004

  
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SUPERVISORY PATENT EXAMINER  
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9/28/04